CLAIMS

1. A method of RTM molding wherein a reinforcing fiber substrate is placed in a mold, resin distribution media each exhibiting a resin flow resistance lower than a resin flow resistance of said reinforcing fiber substrate are placed on both surfaces of said reinforcing fiber substrate, and after a pressure in said mold is reduced by evacuation, a resin is injected into said mold through said resin distribution media to impregnate said reinforcing fiber substrate with said resin injected, characterized in that a resin flow resistance of a first resin distribution medium placed on a first surface of said reinforcing fiber substrate is set lower than a resin flow resistance of a second resin distribution medium placed on a second surface of said reinforcing fiber substrate, and said evacuation is carried out through said second resin distribution medium while said resin is injected into said first resin distribution medium to impregnate said reinforcing fiber substrate with said resin injected.

2. The method of RTM molding according to claim 1, wherein said reinforcing fiber substrate comprises a laminate of reinforcing fiber materials.

3. The method of RTM molding according to claim 1 or 2, wherein said resin flow resistance of said first resin distribution medium is set at 1/3 of said resin flow resistance of said reinforcing fiber substrate or less.

4. The method of RTM molding according to claim 3, wherein said resin flow resistance of said first resin distribution medium is set at 1/10 of said resin flow resistance of said reinforcing fiber substrate or less.

5. The method of RTM molding according to any of claims 1 to 4, wherein a peel ply

capable of being removed together with a resin distribution medium after molding is interposed between at least one resin distribution medium and said reinforcing fiber substrate.

6. The method of RTM molding according to any of claims 1 to 5, wherein a porous sheet is interposed between at least one resin distribution medium and said reinforcing fiber substrate.

7. The method of RTM molding according to any of claims 1 to 6, wherein at least one resin distribution medium is formed by providing a groove as a resin flow path on an inner surface of said mold.

8. The method of RTM molding according to any of claims 1 to 7, wherein injection of a resin is started also through said second resin distribution medium before said resin injected through said first resin distribution medium reaches said second surface.

9. The method of RTM molding according to any of claims 1 to 8, wherein, after a molded product is released from said mold, at least one resin distribution medium is left in said molded product without removing it from said molded product.

10. The method of RTM molding according to any of claims 1 to 9, wherein at least two resin injection gates are disposed above said first resin distribution medium, and resin injection is carried out simultaneously from at least two resin injection gates adjacent to each other, or from all resin injection gates.

11. A method of RTM molding characterized in that a reinforcing fiber substrate is

placed in a mold, a resin distribution medium exhibiting a resin flow resistance lower than a resin flow resistance of said reinforcing fiber substrate is placed on a surface of said reinforcing fiber substrate opposite to said mold, a degasification medium comprising a gas permeation film and a gas permeable substrate is provided between said reinforcing fiber substrate and said mold, a resin is injected into said mold through said resin distribution medium after a pressure in said mold is reduced by evacuation, and said resin injected is impregnated into said reinforcing fiber substrate by evacuating said resin injected from a degasification space formed between said gas permeation film and said mold.

12. The method of RTM molding according to claim 11, wherein said reinforcing fiber substrate comprises a laminate of reinforcing fiber materials.

13. The method of RTM molding according to claim 11 or 12, wherein said gas permeation film has a releasability capable of being delaminated from a molded product after molding.

14. The method of RTM molding according to any of claims 11 to 13, wherein at least two resin injection gates are disposed above said resin distribution medium, and resin injection is carried out simultaneously from at least two resin injection gates adjacent to each other, or from all resin injection gates.

15. The method of RTM molding according to any of claims 11 to 14, wherein at least one evacuation route is provided in said mold in addition to an evacuation route from said degasification space formed between said gas permeation film and said mold.

16. A method of RTM molding wherein a reinforcing fiber substrate is placed in a mold, a resin injection line and an evacuation line each communicating with an inside of said mold are provided, a pressure in said mold is reduced by evacuation and a resin is injected into said mold and impregnated into said reinforcing fiber substrate to form an FRP molded material, characterized in that, after said resin is impregnated into said reinforcing fiber substrate so as to achieve a fiber volume content lower than a target fiber volume content of said FRP molded material, the injection of resin is stopped, and thereafter, evacuation of resin is continued until reaching said target fiber volume content.

17. The method of RTM molding according to claim 16, wherein said reinforcing fiber substrate is formed as a preform having a fiber volume content, which is a rate of a volume of reinforcing fibers relative to a bulk volume of said reinforcing fiber substrate, lower than said target fiber volume content.

18. The method of RTM molding according to claim 16 or 17, wherein, after said injection of resin is stopped, at least one line of resin injection lines is changed to an evacuation line, and said evacuation of resin is continued until reaching said target fiber volume content.

19. The method of RTM molding according to any of claims 16 to 18, wherein said target fiber volume content is in a range of 55 to 65%.

20. The method of RTM molding according to any of claims 16 to 19, wherein said fiber volume content lower than said target fiber volume content is in a range of 45 to 60%.

21. The method of RTM molding according to claim 20, wherein said fiber volume content lower than said target fiber volume content is in a range of 45 to 55%.

22. The method of RTM molding according to any of claims 16 to 21, wherein reaching said target fiber volume content is determined by measurement of a thickness of said reinforcing fiber substrate.

23. The method of RTM molding according to any of claims 16 to 22, wherein an injection amount of resin corresponding to said fiber volume content lower than said target fiber volume content is preset, and said injection of resin is stopped at the time reaching said injection amount preset.

24. The method of RTM molding according to any of claims 16 to 23, wherein an evacuation amount for reaching said target fiber volume content is preset relative to an injection amount of resin, and said evacuation of resin is stopped at the time reaching said evacuation amount preset.

25. The method of RTM molding according to any of claims 16 to 24, wherein at least one layer of said reinforcing fiber substrate comprises a carbon fiber layer.

26. The method of RTM molding according to claim 25, wherein said carbon fiber layer is formed as a woven fabric.

27. The method of RTM molding according to claim 26, wherein said woven fabric is formed as a unidirectional woven fabric.

28. A method of RTM molding characterized in that a plurality of reinforcing fiber materials are laminated in a mold to form a reinforcing fiber material laminate, and a resin is impregnated into said reinforcing fiber material laminate by injecting a resin in a direction from an end surface of said reinforcing fiber material laminate along a laminate surface while reducing a pressure in said mold by evacuation.

29. The method of RTM molding according to claim 28, wherein said resin is injected from said end surface of said reinforcing fiber material laminate mainly into a portion between layers of said reinforcing fiber materials, and resin injected is impregnated into respective reinforcing fiber materials.

30. The method of RTM molding according to claim 28 or 29, wherein a gross length of said reinforcing fiber material laminate is 600 mm or less.

31. The method of RTM molding according to any of claims 28 to 30, wherein a resin viscosity at a temperature for resin injection is maintained in a range of 10 to 1500 mPa・s during a time from starting of resin impregnation to expiration of one hour.

32. The method of RTM molding according to any of claims 28 to 31, wherein a sectional shape of said reinforcing fiber material laminate is a rectangular, C-type, I-type, L-type, Z-type, T-type, J-type or hat shape.

33. The method of RTM molding according to any of claims 28 to 32, wherein said reinforcing fiber material laminate comprises a part for forming a stringer material

having a section of a rectangular, C-type, I-type, L-type, Z-type, T-type, J-type or hat shape, and a part for forming a skin material.

34. The method of RTM molding according to claim 33, wherein, after said resin is injected from an end surface of said part for forming a stringer material of said laminate mainly into a portion between layers of said reinforcing fiber materials, resin injected is impregnated into the entire part for forming a stringer material.

35. The method of RTM molding according to claim 34, wherein for said part for forming a skin material, said resin is impregnated in a thickness direction while distributed in a direction along a surface of said part for forming a skin material via a resin distribution medium, and a reinforcing panel formed from said skin material and said stringer material is molded integrally.

36. The method of RTM molding according to any of claims 28 to 35, wherein an upper mold provided with a resin distribution medium or a resin flow path groove is further disposed on said end surface of said reinforcing fiber material laminate.

ABSTRACT

A method of RTM molding wherein a reinforcing fiber substrate is placed in a mold, each of a first and a second resin distribution media exhibiting a resin flow resistance lower than the resistance of the reinforcing fiber substrate is placed on each surface of the reinforcing fiber substrate, and the inside of the mold is evacuated and a resin is injected into the mold to thereby impregnate the reinforcing fiber substrate with the resin injected, characterized in that the first resin distribution medium exhibits a resin flow resistance lower than that of the second resin distribution medium, and the evacuation is carried out through the second resin distribution medium while the resin is injected through the first resin distribution medium. The method can be advantageously employed for producing, in particular, FRP structure which is thick and excellent in designability, lightweight property and/or strength.